

Breeding ecology of the Pied Avocet *Recurvirostra avosetta* in AghGol wetland, Hamedan Province, Iran

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Abstract – The breeding ecology of the Pied Avocet *Recurvirostra avosetta* was studied during the 2008 breeding season in AghGol wetland, Hamedan province, western Iran. The breeding parameters, i.e. laying date, clutch size, brood size, nest site characteristics, breeding success and nestling body mass at hatching were taken into consideration. Egg laying occurred from 10 May to 9 June. Mean clutch size was 3.13 ± 0.74 (sd) eggs and the mean distance between nests was 2.74 ± 1.01 meters. Nesting occurred in places with vegetation cover of about 40% and at a mean distance of 7.24 ± 2.31 m to water edge. Nests often were built among vegetation, but some occurred on dry mud (25%). Hatching success was 23% and mean net productivity was 0.33 ± 0.19 chicks per nest. The mass of hatchlings was 21.5 ± 3.2 g at the first day. Whole nest failure from human predation and sheep grazing was responsible for most egg losses. About 75% of the nests failed, being destroyed before hatching. Some conservation measures for this breeding colony are discussed.

Riassunto – È stata studiata la biologia riproduttiva dell'avocetta *Recurvirostra avosetta* durante la stagione riproduttiva 2008 nella palude di AghGol, Iran occidentale (provincia di Hamedan). Sono stati misurati diversi parametri riproduttivi: data di deposizione, dimensione della covata e della nidiate, caratteristiche del nido, successo riproduttivo e peso dei pulcini alla schiusa. La deposizione è avvenuta dal 10 maggio al 9 giugno, la covata è stata di 3.13 ± 0.74 (sd) uova, mentre la distanza media tra i nidi è stata di 2.74 ± 1.01 m. I nidi erano posti in siti con una copertura vegetale intorno al 40%, e a 7.24 ± 2.31 m dalle sponde. I nidi spesso sono localizzati tra la vegetazione, ma il 25% di essi era su fango secco. Il successo di schiusa è stato del 23%, e la produttività netta media è stata di 0.33 ± 0.19 pulcini per nido. Questi pesavano 21.5 ± 3.2 g durante il primo giorno. La maggior parte delle perdite (il 75% circa dei nidi è stato distrutto prima della schiusa) è dovuta alla raccolta effettuata dall'uomo, e al pascolo ovino. In conclusione sono proposte alcune misure di protezione per questa colonia.

INTRODUCTION

The Pied Avocet *Recurvirostra avosetta* is a partial migrant, summer visitor to central and East Turkey, winters in the most of eastern Mediterranean countries and Iran. This bird inhabits saline and mudflats estuaries and sandbanks, breeding colonially near shallow waters (Porter *et al.* 2006). The global range of the Pied Avocet is quite discontinuous, with a series of isolated breeding areas extending South from Western Europe, through the Mediterranean to eastern and southern Africa, and East through the Black Sea and southern Asia to eastern Asia (Cramp & Simmons 1983). North-west European breeding birds move South-west to winter mainly on the coasts of Ibe-

ria whilst other European birds move to North Africa and the Persian Gulf. Pied Avocets usually nest in dense colonies in which pairs occupy tiny nesting territories (Cramp & Simmons 1983), and colonial nesting is thought to be essential for successful hatching in this species (Hotker 2000). Pied Avocet was a very common breeding bird on the shores of Lake Urumiyeh, Azarbaijan (1500-2000 pairs), Lake Tashk and Lake Bakhtegan, Fars (about 100-150 pairs), and the Helleh Delta, Bushehr (7 pairs) in the 1970s (Scott 2007). Although Pied Avocet is a breeding waterbird in Iran (Porter *et al.* 1996, Scott 2007, Mansoori 2008), data on its breeding ecology are scanty. Nest-site selection and nest characteristics in Pied Avocets were investigated in a mixed-species colony in AghGol wetland, Hamedan Province of Iran. The aims of this study were to investigate the breeding status, nest site selection, egg characteristics, breeding success and the causes of nesting failures.

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STUDY AREA AND METHODS

Study Area

AghGol (34°29'N, 49°02'E) is a seasonal freshwater wetland covering between 450 and 1500 ha, depending on annual rainfall. It is located near the village of Nasir-Abad, about 35 km SE of Hamedan on the border of Markazi Province (Barati 2008). Mean water depth is about 70 cm, decreasing during the study period. The waterbird community of this wetland includes Grey Heron *Ardea cinerea*, Black Stork *Ciconia nigra*, White Stork *C. ciconia*, Eurasian Spoonbill *Platalea leucorodia*, Greater Flamingo *Phoenicopterus ruber*, Common Shelduck *Tadorna tadorna*, Eurasian Teal *Anas crecca*, Mallard *A. platyrhynchos*, Common Pochard *Aythya ferina* and Northern Lapwing *Vanellus vanellus*. In spite of these interesting presences, the area has no formal protection (Ashoori *et al.* 2007).

Data Collection

We conducted a monthly count of the number of Pied Avocets in this wetland from September 2007 to June 2008. In each visit the waterbirds including Pied Avocet were counted by at least two observers. From early May 2008, Pied Avocet nests were located by searching possible nesting areas. Every nest found was numbered, marked and its content recorded. The nests were monitored every 2-3 days, but more concentrated visits were made during the hatching period. In this period the nests were visited almost every day at about 3.00-4.00 pm. On each visit the content of nest was checked and every change was recorded, taking into account the possible losses of eggs and/or chicks. Measurements of eggs (length and width) and chicks (body mass) were made by using a caliper and a pocket digital scale (to nearest 0.1 mm and 0.1 g respectively). Nest measurements of external and internal (when

it was measurable) diameter and inner cup, and the distance between nests were taken. The vegetation density around the nesting place was estimated in a square plot of 1x1m around each nest. The volume of eggs was calculated from the relationship: Volume = 0.51 LxB², where L is the length and B is the width (maximum diameter), according to Hoyt (1979). Causes of failures and the percentages of successful nests were obtained. Means are reported ± 1 SD.

RESULTS

Population Status

The highest number of Pied Avocets was observed in May 2008 (70-80 individuals). Between March and May there was an increasing trend in the number of birds but they declined in June, disappearing in July, because the wetland became completely dry, following a lack of rainfall in spring of 2008. The other factor negatively affecting the water table was the using of the water stock in agriculture activities around the wetland. The breeding population of Pied Avocet was estimated at about 50 individuals.

Breeding Biology

Egg laying occurred from 10 May to 9 June. Most of the eggs were laid during 21-30 May (Fig. 1). Nests were built mainly in dense vegetation or in a shallow scrape on bare mud or in sparse vegetation. Nests were composed of short pieces of stems, roots, and leaves of marsh vegetation (Fig. 3). Mean clutch size was 3.13 eggs (n = 21, median: 3, SD: 0.74, range: 2-4). Nests with a clutch size of three were most abundant but their frequency was not significant ($\chi^2 = 1.6$, df = 2, P > 0.05) (Fig. 2). Nests were placed at a mean distance of 2.74 ± 1.01 m from each other. Nesting

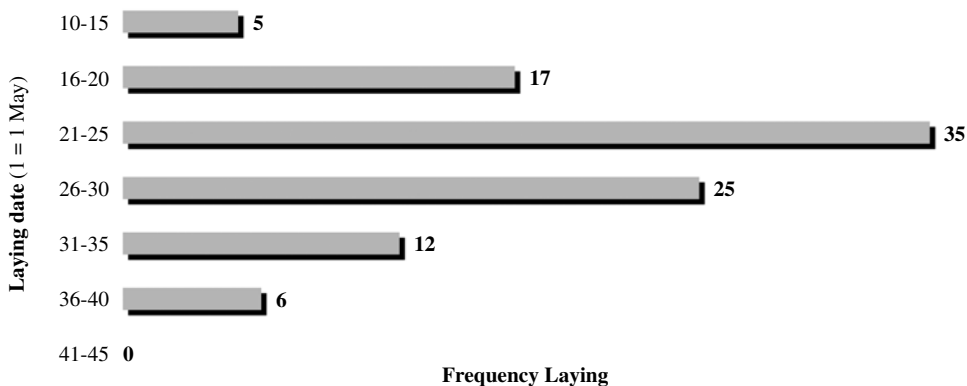


Figure 1. Distribution of egg laying dates in Pied Avocet colony at AghGol wetland during the 2008 breeding season – *Distribuzione di frequenza delle date di deposizione dell'avocetta ad AghGol, durante la stagione riproduttiva 2008.*

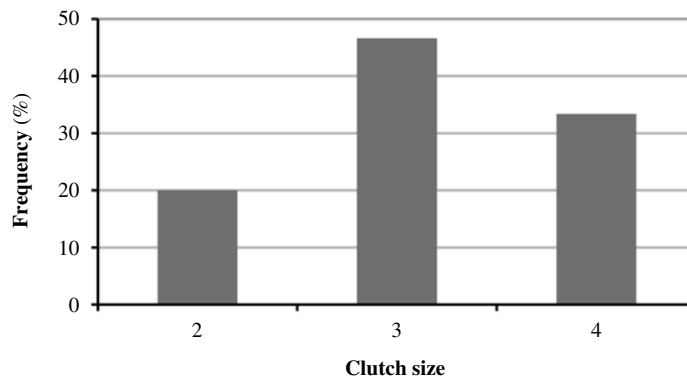


Figure 2. Clutch-size class distribution (%) in Pied Avocet breeding colony at AghGol wetland during the 2008 breeding season – *Distribuzione percentuale delle dimensioni della covata dell'avocetta ad AghGol, durante la stagione riproduttiva 2008.*

occurred in places with vegetation cover of about 40% and at a mean distance of 7.24 ± 2.31 m to water edge (Tab. 1), although the most favorite site for nesting included areas located 1 to 3 meters to open water (> 50% of nests). Nests often were built among vegetation but some of them occurred on dry mud (25%). Egg characteristics are described in Tab. 2. Mean incubation period was 23.5 days ($n = 8$, $SD = 1.6$). Mean brood size was 0.71 ± 0.12 chicks. The first chick was observed on 2 June but it was dead (Fig. 4). Mean body mass of Pied Avocet chicks was 21.5 g ($n = 6$, $SD = 3.2$) at the first day of hatching.

Breeding Success

Of the 65 eggs laid only 15 hatched (23%). Of 15 hatchlings about 50% were found subsequently dead. Mean net productivity of nests was therefore 0.33 ± 0.09 chicks per

nesting attempt. Total nest failures during incubation were recorded for 75% of nests. Many of the nests were destroyed because of decreasing in water level which results in increasing accessibility of nests by sheep keepers. Also mortality among chicks was high and some 50% of nestlings were found dead (Fig. 4). One nest placed next to the water and not on the raised surface was flooded. Some nests were abandoned for unknown reasons.

DISCUSSION

In Iran the Pied Avocet has a breeding range that mainly encompasses northern and western provinces. It breeds in MaharLo, Tashk and Bakhtegan wetlands (Mansoori 2008) and was a very common breeding bird in NW and SW



Figure 3. Pied Avocet nest with a hatched nestling (photo: A. Barati) – *Nido di avocetta con un pulcino alla schiusa.*

Table 1. Characteristics of Pied Avocet nests in AghGol wetland during the 2008 breeding season – *Caratteristiche dei nidi di avocetta nella palude di AghGol, durante la stagione riproduttiva 2008.*

Characteristics	Mean	SD	Median	Min	Max	N
Nest diameter (cm)	16.70	3.25	15	13	24	21
Cup depth (cm)	1.94	1.03	2	0	3.3	21
Distance to water edge (m)	7.24	2.52	8.50	2.80	9.60	21
Vegetation cover (%)	41.47	34.40	30	5	100	21
Distance to closest nest (m)	2.74	1.01	2.50	0.8	4.1	21

Iran in previous years (Scott 2007). However, its breeding has not been recorded in AghGol wetland in previous reports (Porter *et al.* 1996, Scott 2007, Mansoori 2008). In this wetland the Pied Avocet had a breeding population of about 45-50 individuals in 2008 breeding season. In previous years (2001-2006) this wetland was dry and confirmed instances of the breeding of Pied Avocet during this period are lacking. Only in 2007 Pied Avocet bred in AghGol wetland (Barati 2008). Identification of parameters of the nesting environment of Pied Avocet was based on measurements of habitat characteristics (distance to water, to nearest nest, vegetation density) at nest-sites. A preferred site for nesting along the wetland included from 1 to 3 meters to open water. Nest diameter was 16.7 cm, lower than 22.4 cm in the study of Cuervo (2004) in Veta la Palma, Doñana Natural Park, southwestern Spain. Also nest depth was 1.94 cm, close to 2 cm reported from the same location. The distance to water was 7.24 m, more than 28.7 cm reported by Cuervo (2004) who also obtained a mean distance of 4.9 m to closest nest, a value greater than 2.74 m recorded in our study. It seems that suitable nesting areas are restricted in our wetland. Mean clutch size was 3.13 eggs, less than the mean of 3.9 eggs reported by Lengyel (2006). Also the egg mass (29.37 g) and volume (31.24 cm³) result lower than those reported by

Table 2. Statistics of Pied Avocet eggs during 2008 breeding season in AghGol wetland. EL = egg length (mm), EW = width (mm), EM = mass (g) and EV = volume (cm³) – *Statistiche delle uova di avocetta, registrate nella palude di AghGol nella stagione riproduttiva 2008. EL, lunghezza (mm); EW, larghezza (mm); EM, peso (g); EV, volume (cm³).*

Trait	N	Mean	SD	Median	Min	Max
EL	33	51.58	2.47	51	47	58.3
EW	33	35.10	4.00	34.6	32.3	56.6
EM	33	29.37	2.91	28.9	24.5	37.1
EV	33	31.24	2.55	31.4	25.7	35.6

the same author (31.1 g and 31.3 cm³ respectively). The hatching success of Pied Avocet in AghGol wetland was 23% in 2008. Hatching success of 81% with 12% of nests abandoned for unknown reasons is reported from the salt-pans of Cabo de Gata in the Iberian Peninsula (Nogueira *et al.* 1996). In that colony some islands suffered high clutch failure rates due to flooding, which was not an important cause of mortality in our study. Hatching success found in this study was also lower than that reported from a coastal population of Pied Avocet (57% of the eggs hatched, range in nine other studies: 42%-77%, see Hötter & Segebade 2000). Some failures in nesting attempts came from drainage of water and consequent increasing accessibility of nests. Some nests were abandoned for unknown reasons. It has been shown that nests of Pied Avocet have lowest daily survival rate in late periods of breeding (Cuervo 2004). In the present study also we found that nest failures took place in the late periods of breeding season mainly because of increasing accessibility and consequent destruction of nests. The chick survival was low and mortality among chicks was frequently observed. Although brood-level data on chick fledging success are scarce, low chick survival has been found in Pied Avocet populations (Hötter & Segebade 2000). In Pied Avocet chick survival is reported to be poor, this is determined largely by weather conditions and food supply, although there was not much loss of nests from flooding (Nogueira *et al.* 1996). From a conservation point of view, the main threat to waders is loss or degradation of their habitat, and their conservation should be based on detailed ecological studies (Dowding & Murphy 2001). For all these reasons, long-term studies are necessary to monitor yearly variation in nest survival and breeding performances of the Pied Avocet at AghGol wetland.

Considering the ecomorphological peculiarities of this wetland, waders are obliged to build their nests at the very edge of water. This kind of nest-site selection is an important factor to protect nests and eggs, reducing any kind of disturbance, and therefore enhancing breeding success. Notwithstanding, egg losses are high and imputable to fail-

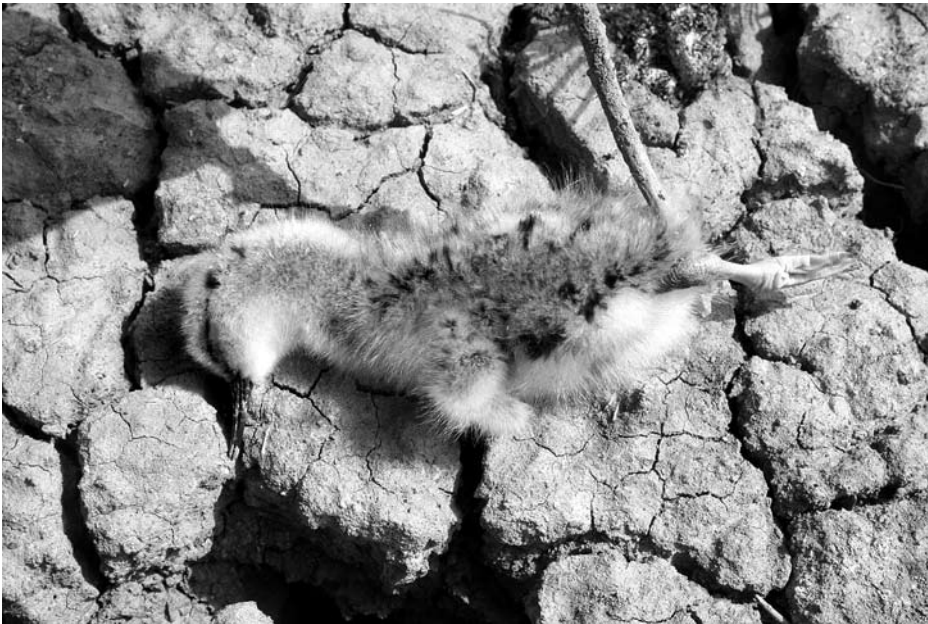


Figure 4. An example of chick mortality in AghGol wetland during the 2008 breeding season (photo: A. Barati) – *Un esempio di mortalità nei pulcini di avocetta ad AghGol, durante la stagione riproduttiva 2008.*

ure of entire nest during the incubation period. Some local people may have removed the eggs and some nests were destroyed by sheep. Another threat for breeding Pied Avocets in AghGol wetland is disturbance from fishermen and other recreational activities. Another important threat comes from human economic activities directly affecting the wetland, especially the utilization of water for agricultural purposes, that quickens the wetland drainage (Ashoori *et al.* 2007). All these activities must bring under control to prevent the destruction of this Pied Avocet breeding colony. Preventing drainage and the regular monitoring of waterbird community are both necessary for the conservation of this wetland, that, in spite of its important role in waterbird conservation, nowadays is not under effective protection (Barati 2008).

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